

Enerji Sektöründe Dijitalleşme

Bariş Sanlı
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Ana fikirler

Dijitalleşme son 80 yıldır vardı ve olacak

Ama eğilimler doğrusal değil

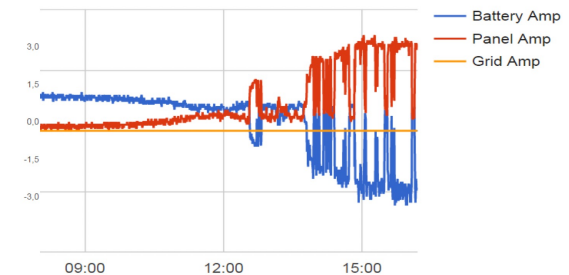
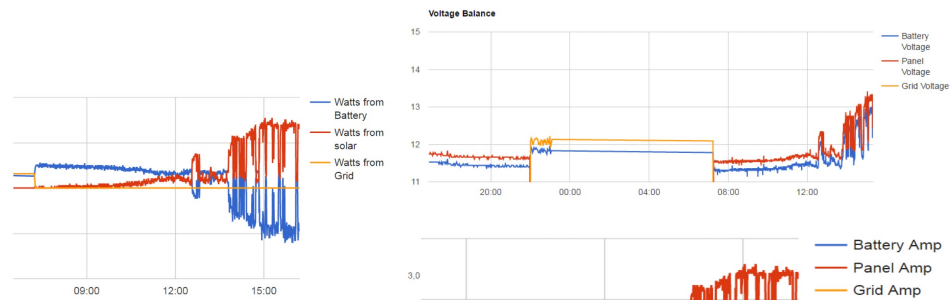
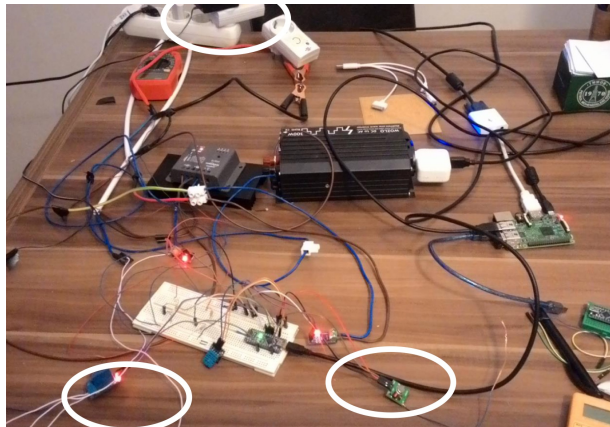
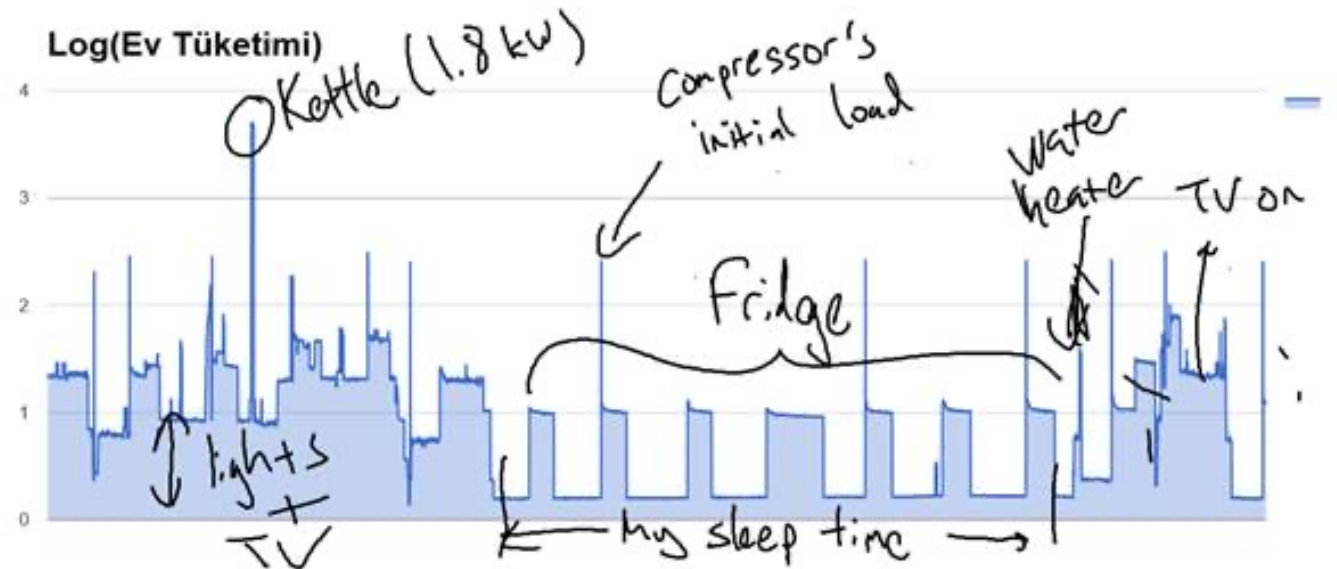
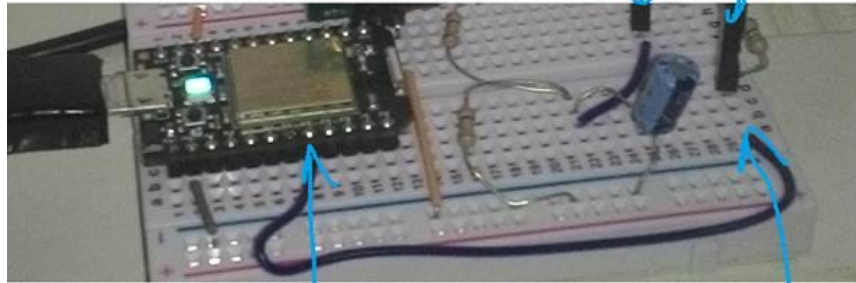
Algoritmalar dünyayı daha temiz yapmayabilir

Çekici kavramlar gerçekler ile uyumlu değil

Hangi teknolojiler kazanacak? Monte Carlo

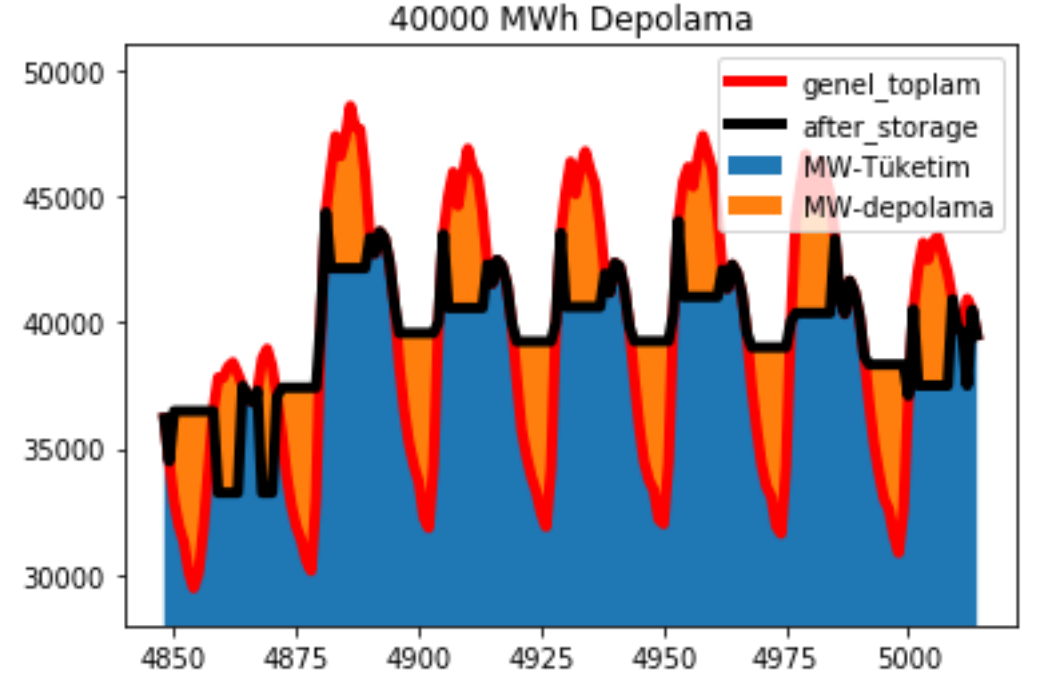
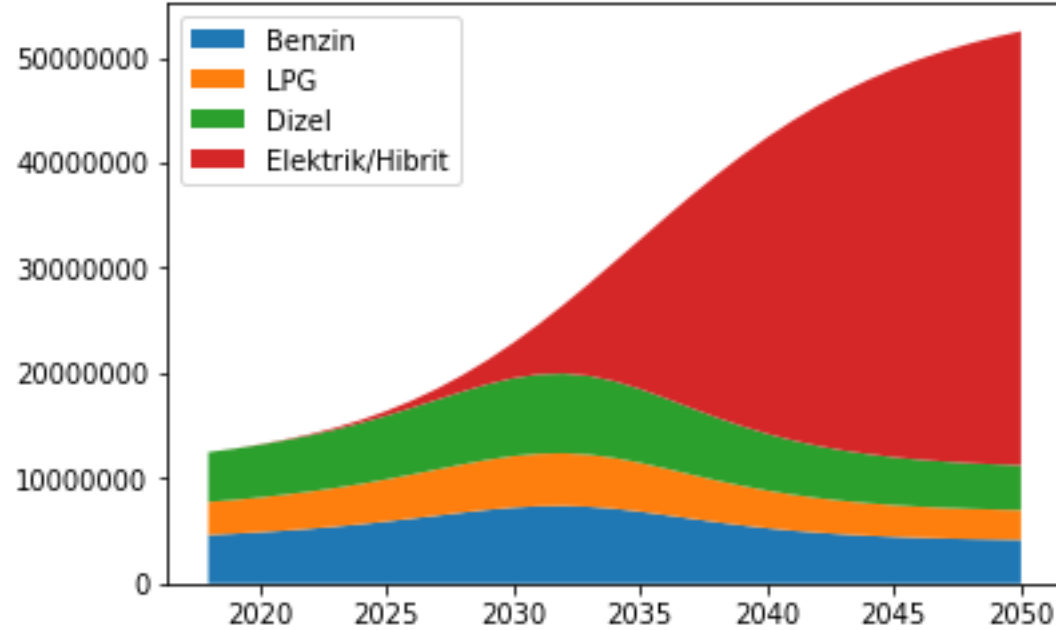
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barissanli.com/python

- Enerji depolama simulasyonu
- Türkiye elektrikli araba penetrasyon simulasyonu



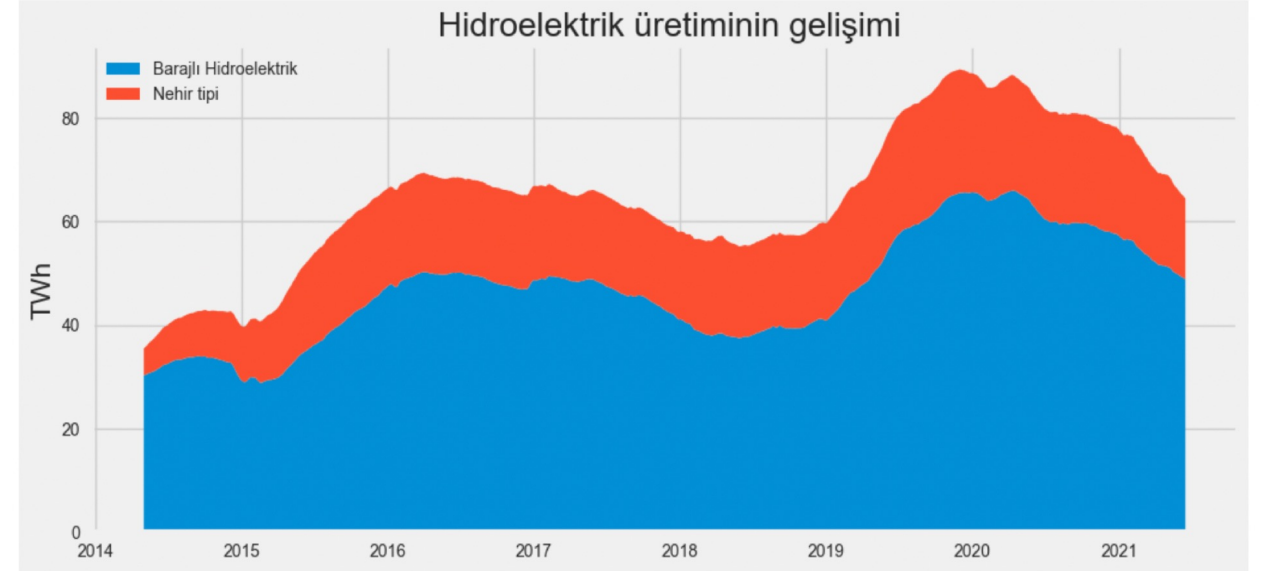
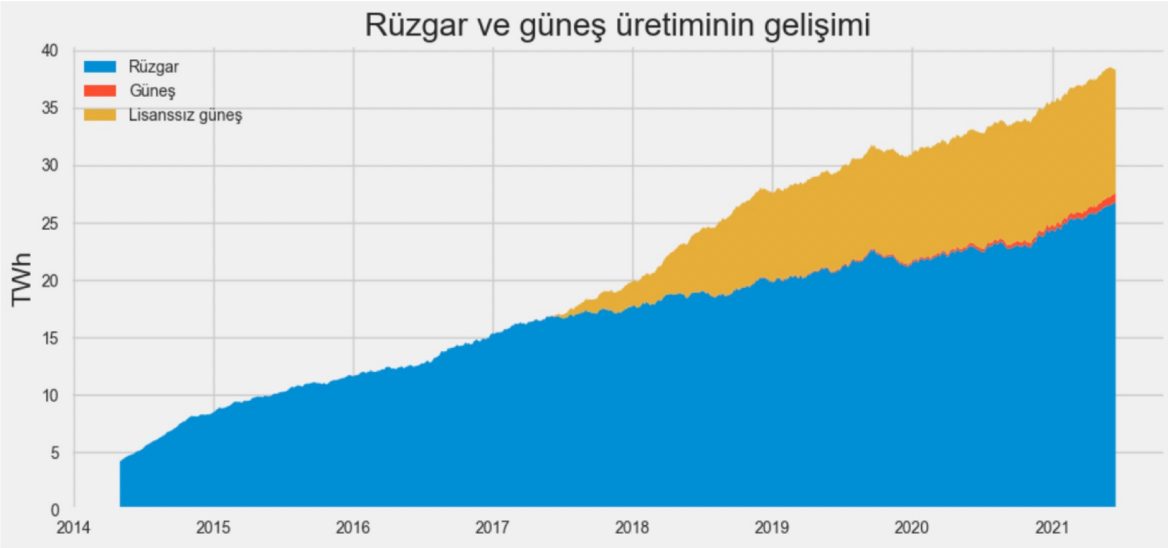


Enerji \neq Elektrik

Dijitalleşme

- Dijitalleşme ile Temiz enerji ?
 - Petrol ve gaz da daha hızlı
- Farklı seviyeler var
 - Büyük operasyon , ticaret, tüketim
- Temel beklenti
 - Intermittent – Kontrol edilemez ama öngörülebilir
 - İşletme ve yapay zeka
 - Ör:
 - Dağıtım şirketi = Mikroşebekeler Federasyonu
 - Yapay zeka temelli adalamalı elektrik kesintileri
 - Elektrikli arabalar şebekeye elektrik satar mı?

Türkiye’de yenilenebilir üretim



<http://barissanli.com/calismalar/2021/20210621-uzundonemli.pdf>

Veri seti : <http://barissanli.com/calismalar/2021/20210101-epias-raw.pkl>

Jupyter Notebook: <http://barissanli.com/calismalar/2021/202106-uzundonemli.ipynb>

Dünyada süreç nasıl işliyor?

- IEEE, dünyaca ünlü yayınlar
- Araştırmacılar/bilim adamları -> Şirketler
- Şirketler -> Danışmanlık şirketleri
- Danışmanlık şirketleri -> CEO
- CEO -> Küresel sunumlar
- “Gelen/dünyayı kasırıp kavuracak” -> Trendler
- 3-5 sene sonra 1.adıma geri dön

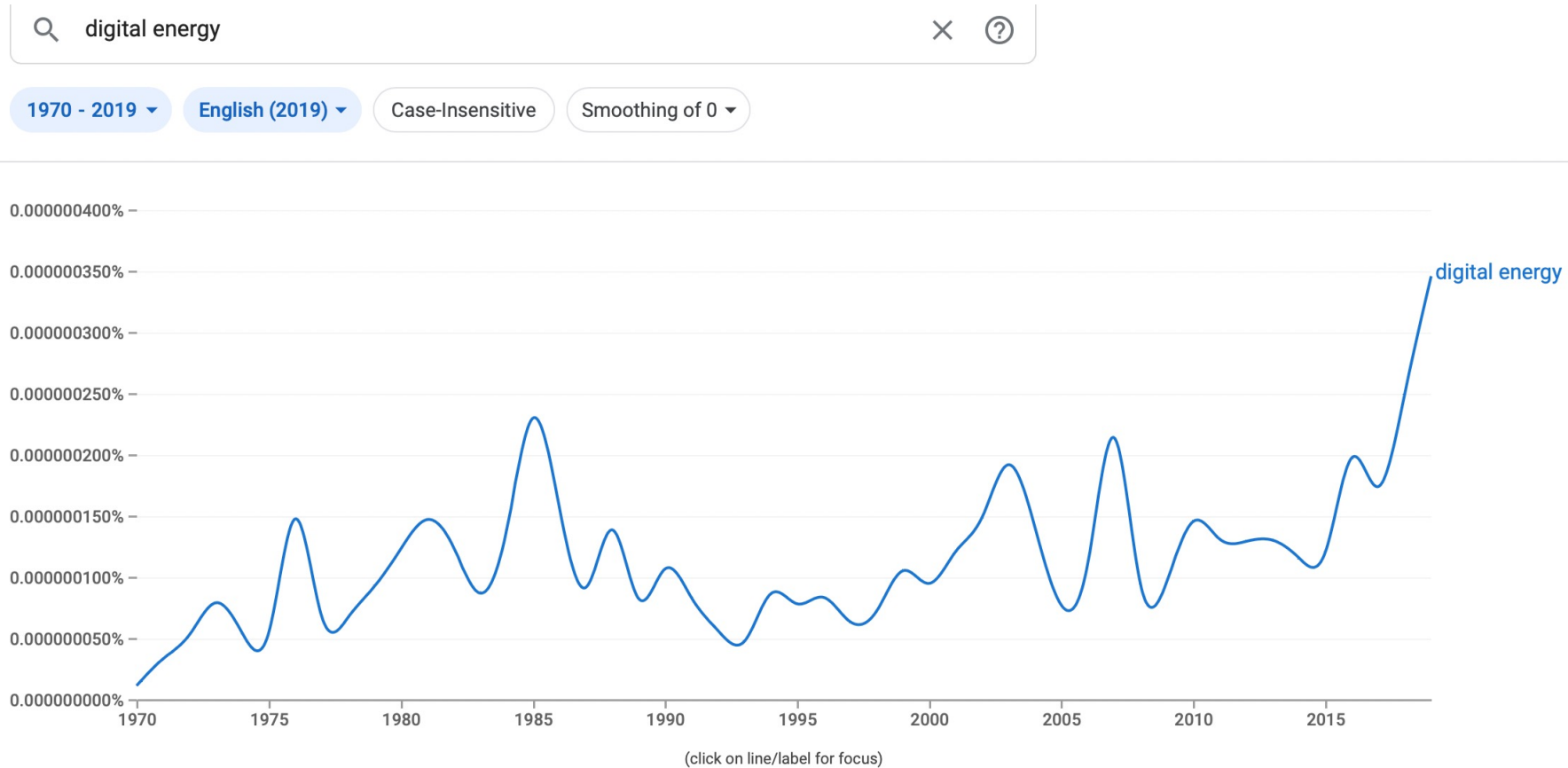


Önemli sorular

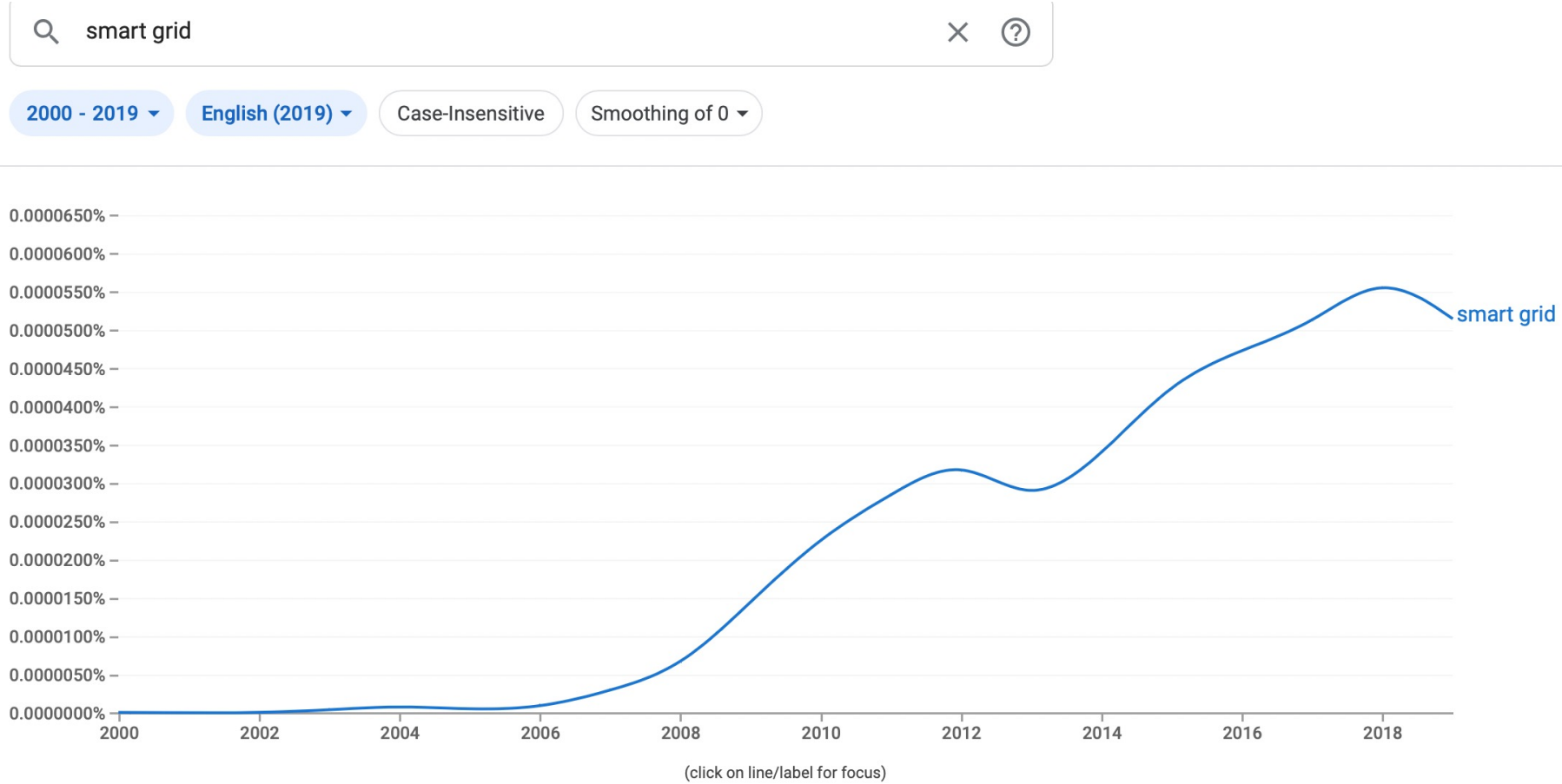
- 3 boyutlu TV'ler neden tutmadı?
- Tüketici elektrikli arabaları tercih edecek mi?
- Dağıtık bir enerji sistemi geliyor mu?
- Fosil kaynakların sonu mu? Sıfır ile net sıfır farkı?
- Tüketici değişmek istiyor mu?
- Dijitalleşme daha çok 1-0 değil daha fazla insani bilimleri öne mi çıkarıyor?
- Elektrifikasyon nasıl hızlanır?
- Yeni kavramlar gerekir mi? Güneşte mesela MW baz yük eşdeğer?
- Dijitalleşme diyoruz ama hep Python tarafındayız, çip-sensör tarafı tamamen ihmal edilmiş görünüyor.
- Enerji dönüşümünün kendi akli ve hızı mı var?



Enerjide dijitalleşme – Yeni trend

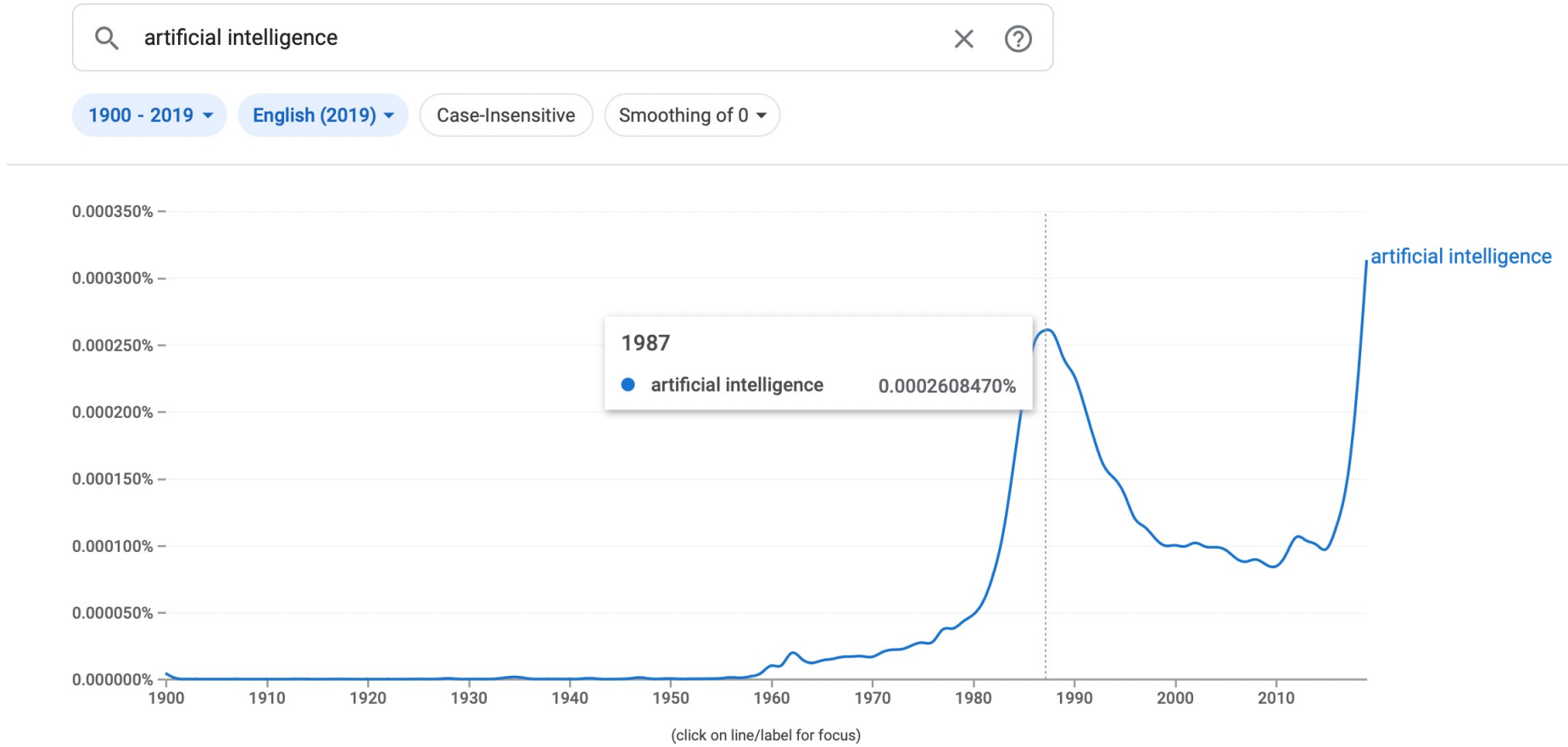


Akıllı şebeke



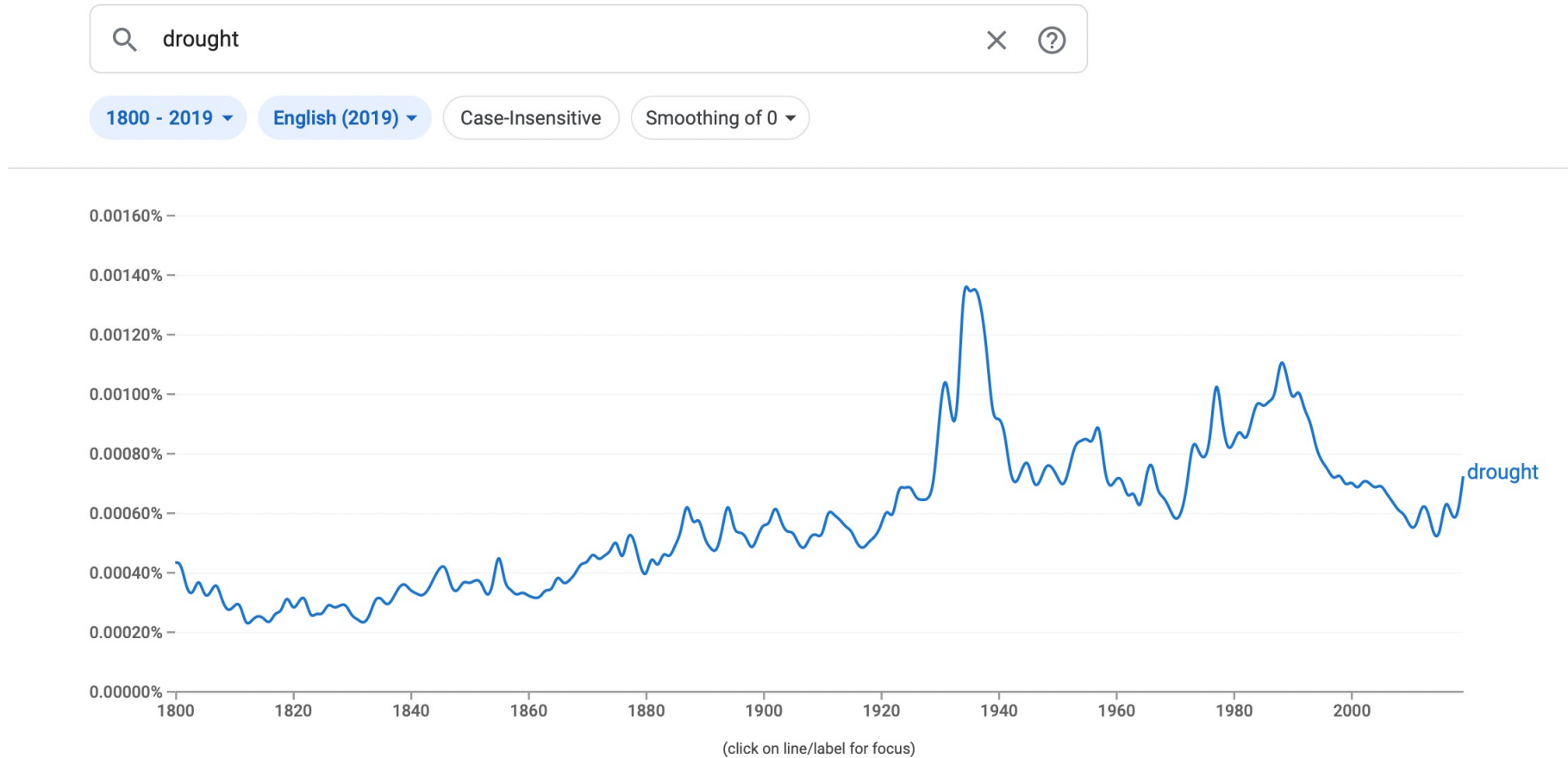
<https://books.google.com/ngrams/>

Yapay zeka – Yeni trend



https://books.google.com/ngrams/graph?content=artificial+intelligence&year_start=1900&year_end=2019&corpus=26&smoothing=0

Kuraklık – giderek artıyor

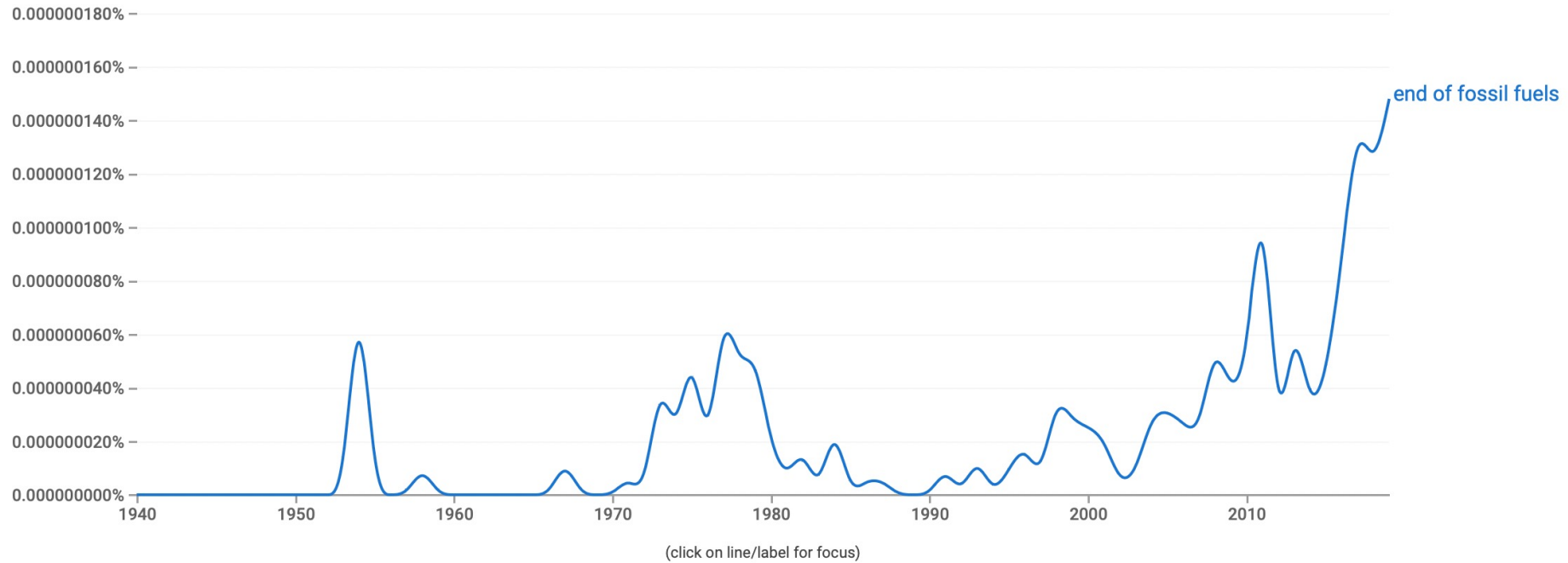


https://books.google.com/ngrams/graph?content=drought&year_start=1800&year_end=2019&corpus=26&smoothing=0

Fosil yakıtların sonu

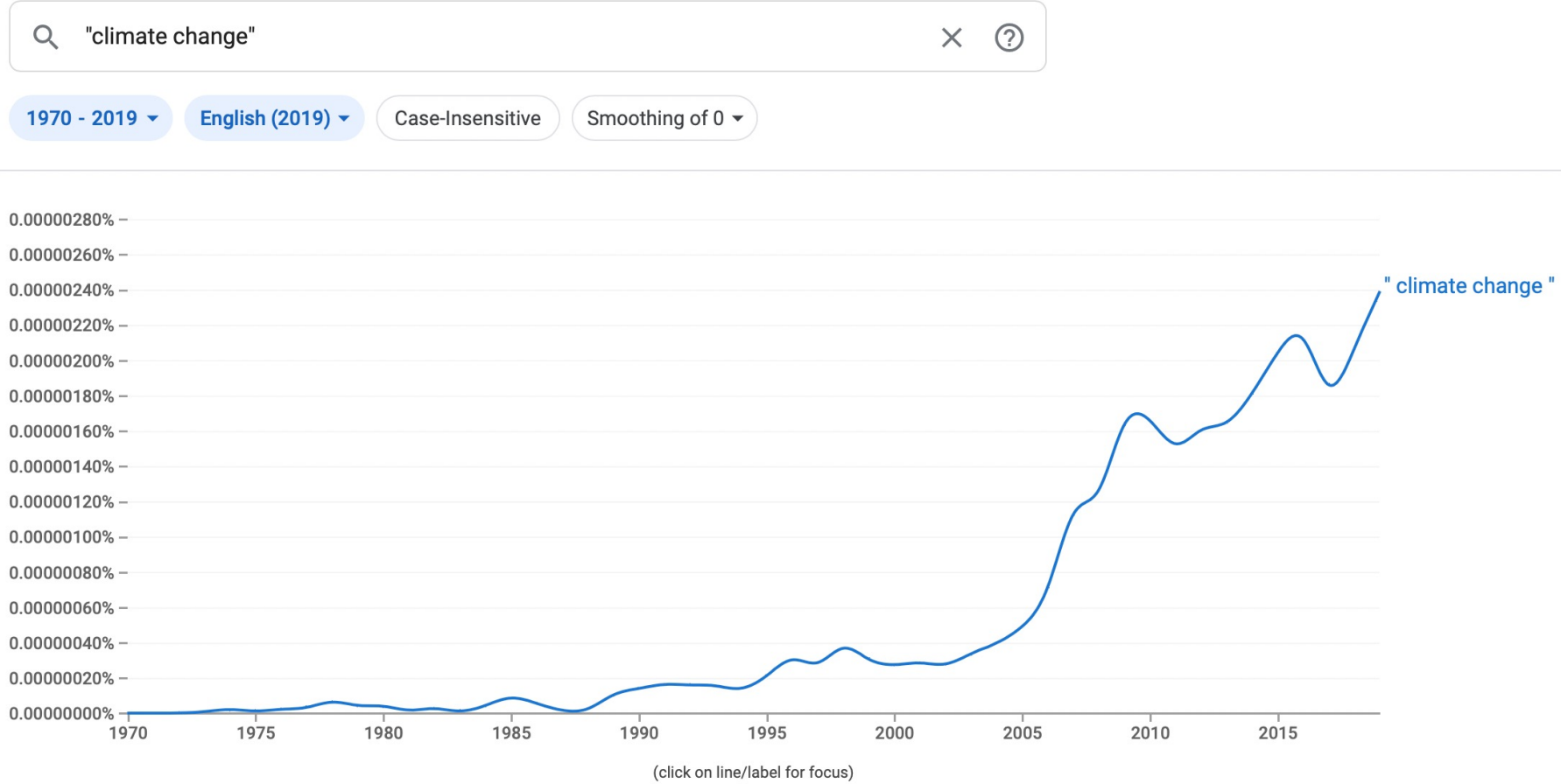
end of fossil fuels

1940 - 2019 English (2019) Case-Insensitive Smoothing of 0



https://books.google.com/ngrams/graph?content=end+of+fossil+fuels&year_start=1940&year_end=2019&corpus=26&smoothing=0

İklim Değişikliği – Yeni trend

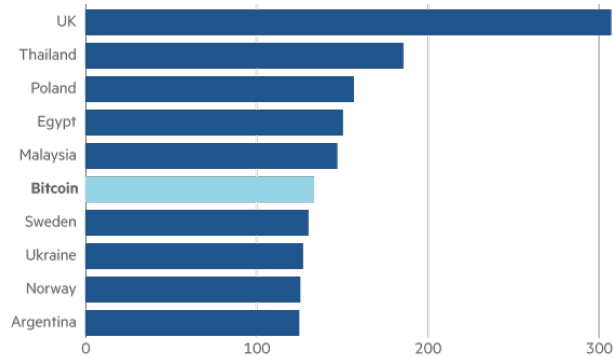


https://books.google.com/ngrams/graph?content=%22climate+change%22&year_start=1970&year_end=2019&corpus=26&smoothing=0

Dijitalleşme

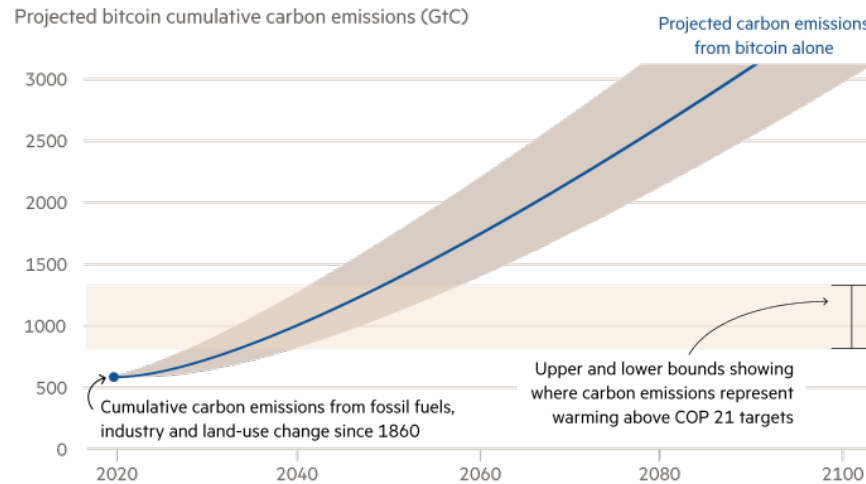
- VW skandalının arkasında yatan sebep dijitalleşme
- Bitcoin (örnek olarak)
 - Algoritmalar dost mu düşman mı

Bitcoin consumes around half as much electricity as the UK
Annualised consumption of bitcoin, compared with countries' readings (TWh)



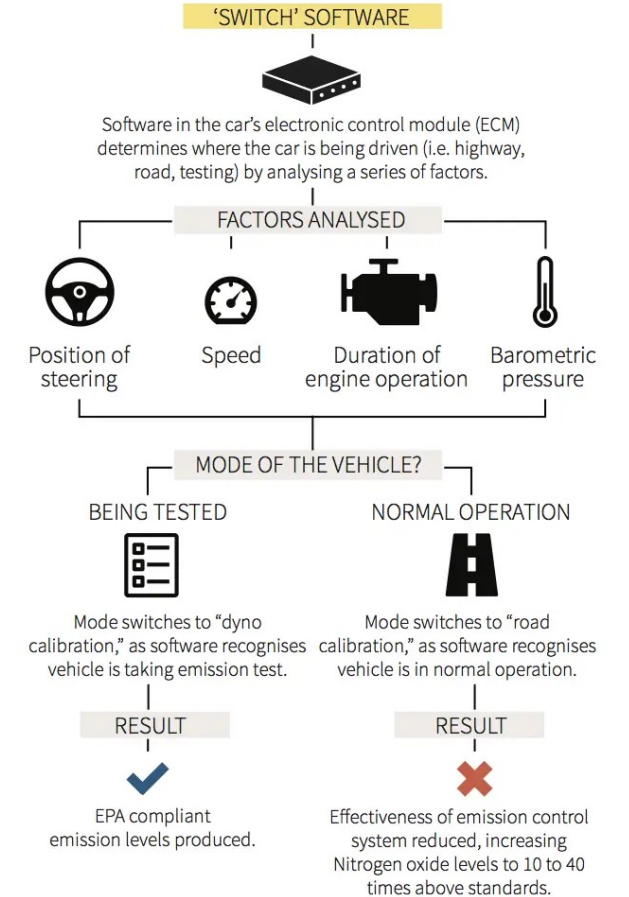
Using assumption that electricity cost paid by miners globally is \$0.05 per kWh. Bitcoin data from May 19 2021. Country data from 2019 or most recent year. Source: Cambridge Bitcoin Electricity Consumption Index © FT

Bitcoin alone could increase global warming past 2C within three decades



Projection based on average growth rate of other broadly adopted technologies. Source: Mora, Rollins, et. al. Nature Climate Change © FT

How Volkswagen's defeat device works



Source: U.S. Environmental Protection Agency
J. Wang, 22/09/2015

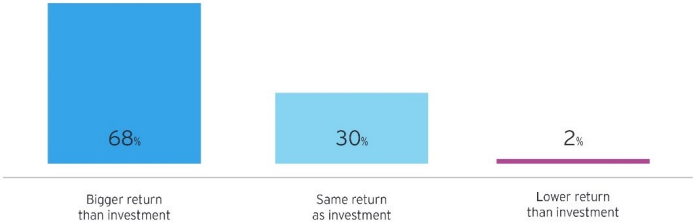


<https://www.ft.com/content/1aecb2db-8f61-427c-a413-3b929291c8ac>

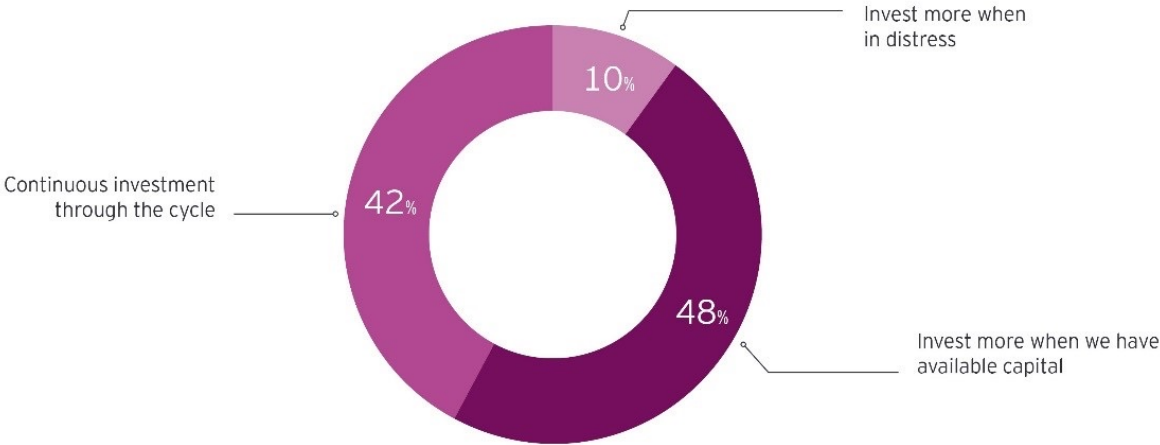
<https://www.businessinsider.com/heres-what-volkswagen-did-and-how-they-got-caught-2015-9>

Petrol ve gaz da dijitalleşme

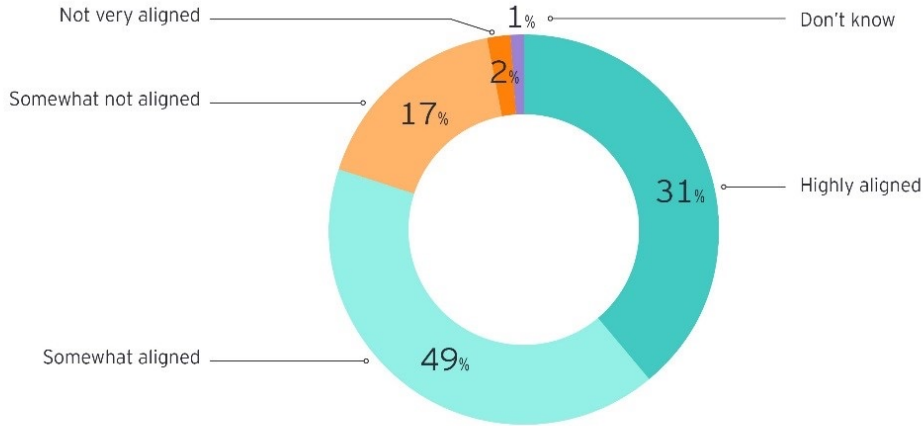
What is the return threshold for digital investments?



What effect do margins have on your company's pace of digital innovation



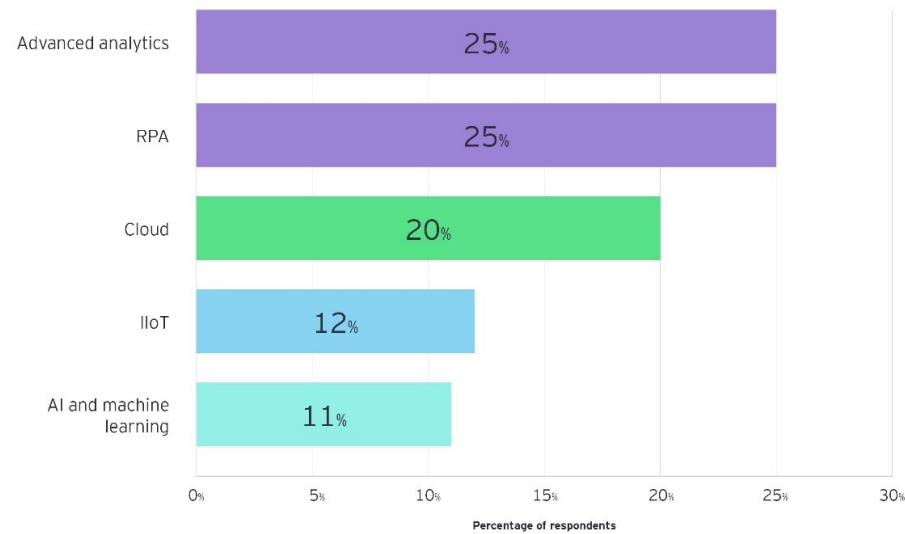
In your opinion, how aligned is your vision for the company's digital technology investment with the views of other senior management?



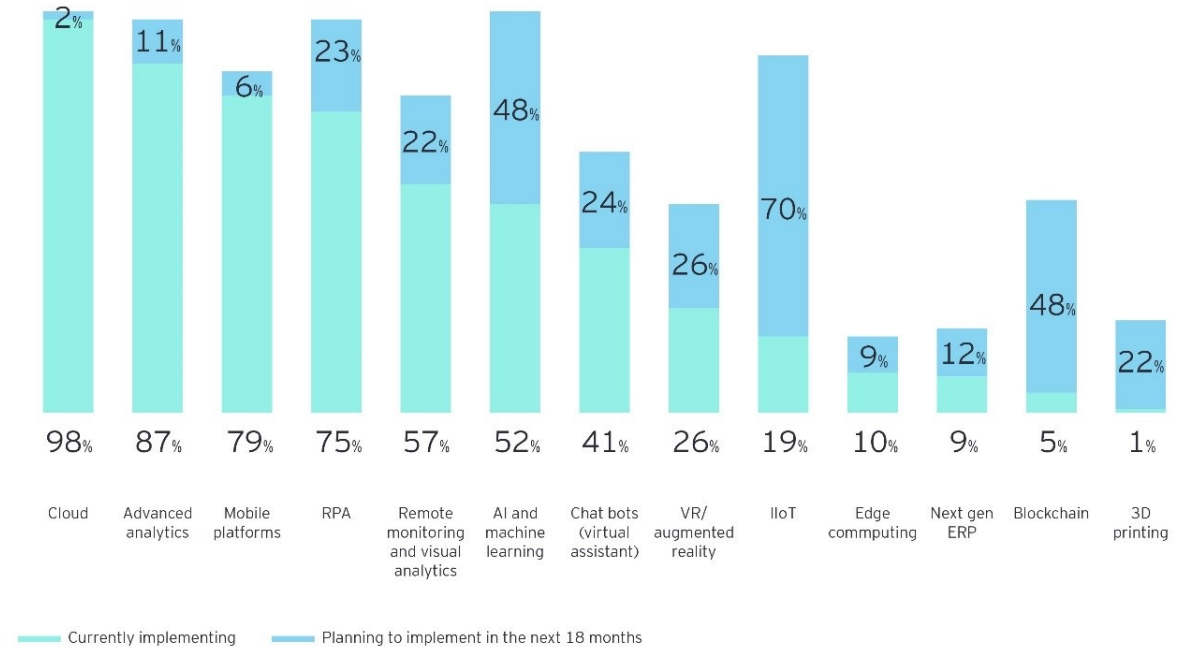
Nerelerde dijitalleşme

Which of the following technologies do you expect to have the greatest positive impact on your business over the coming five years?

(Select the most important)



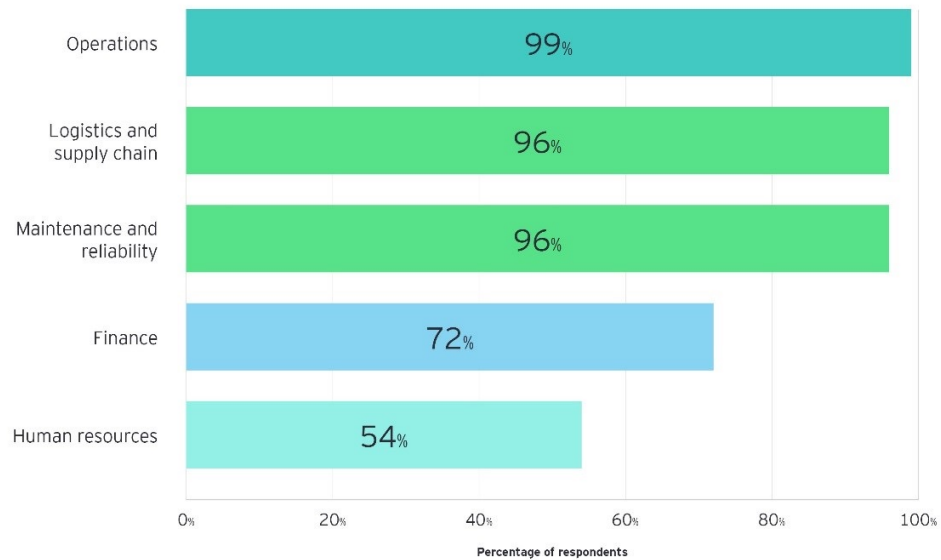
Which of the following technologies is your company currently implementing? And which do you plan to implement in the next 18 months?



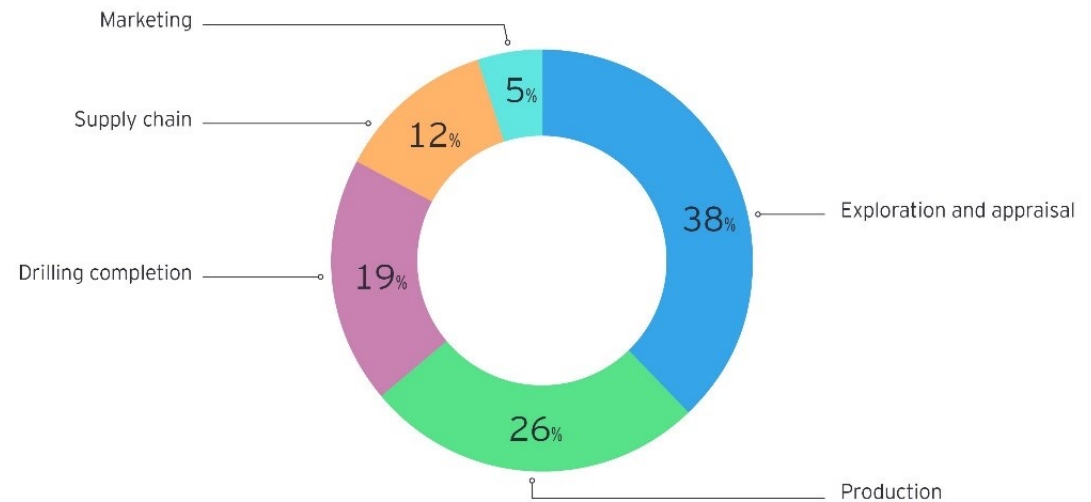
Değer zincirinde dijitalleşme

In which parts of your value chain do you plan to invest in digital technology?

(Select all that apply.)



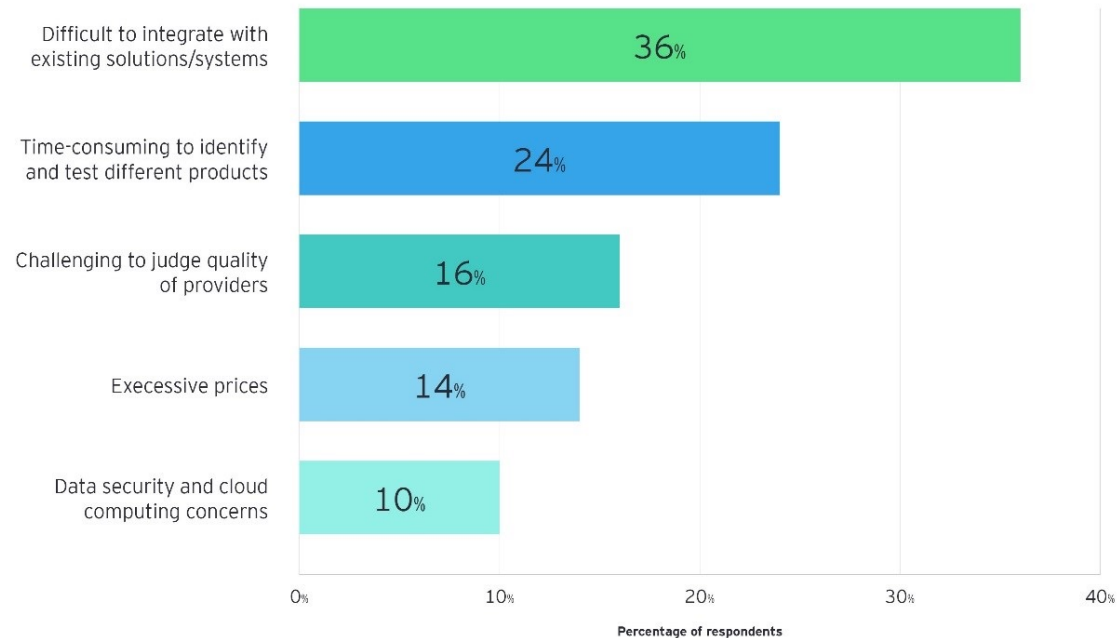
Percentage of respondents' digital technology spend devoted to different parts of the upstream value chain (average)



Değer zincirinde dijitalleşme

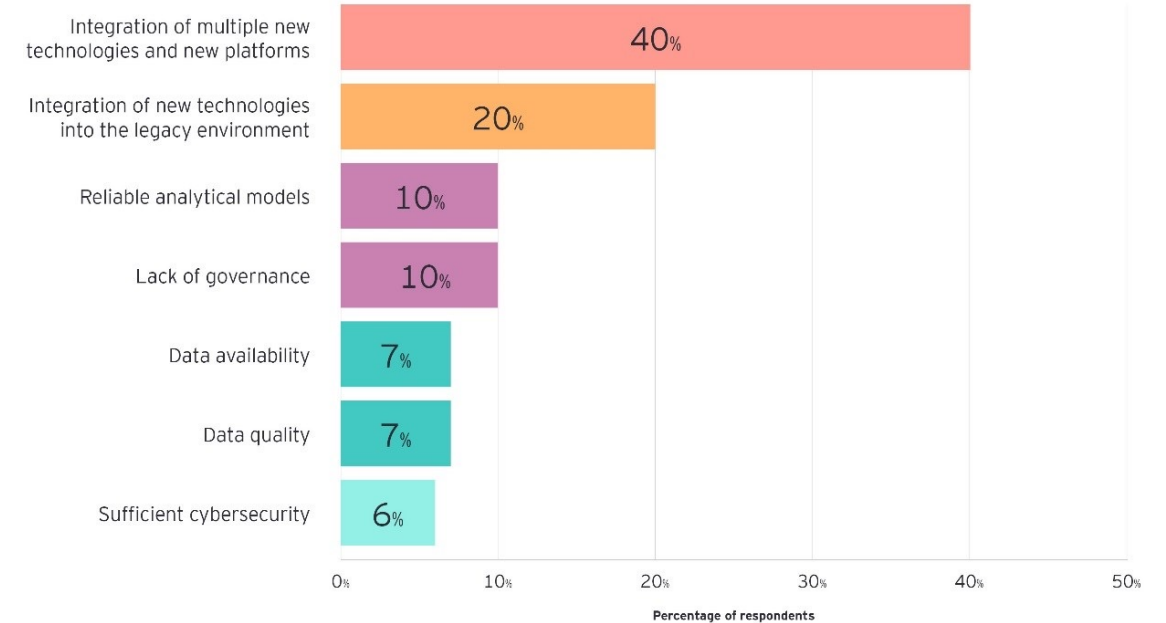
What is the biggest challenge of or barrier to using service providers for digital technology applications?

(Select the most important.)

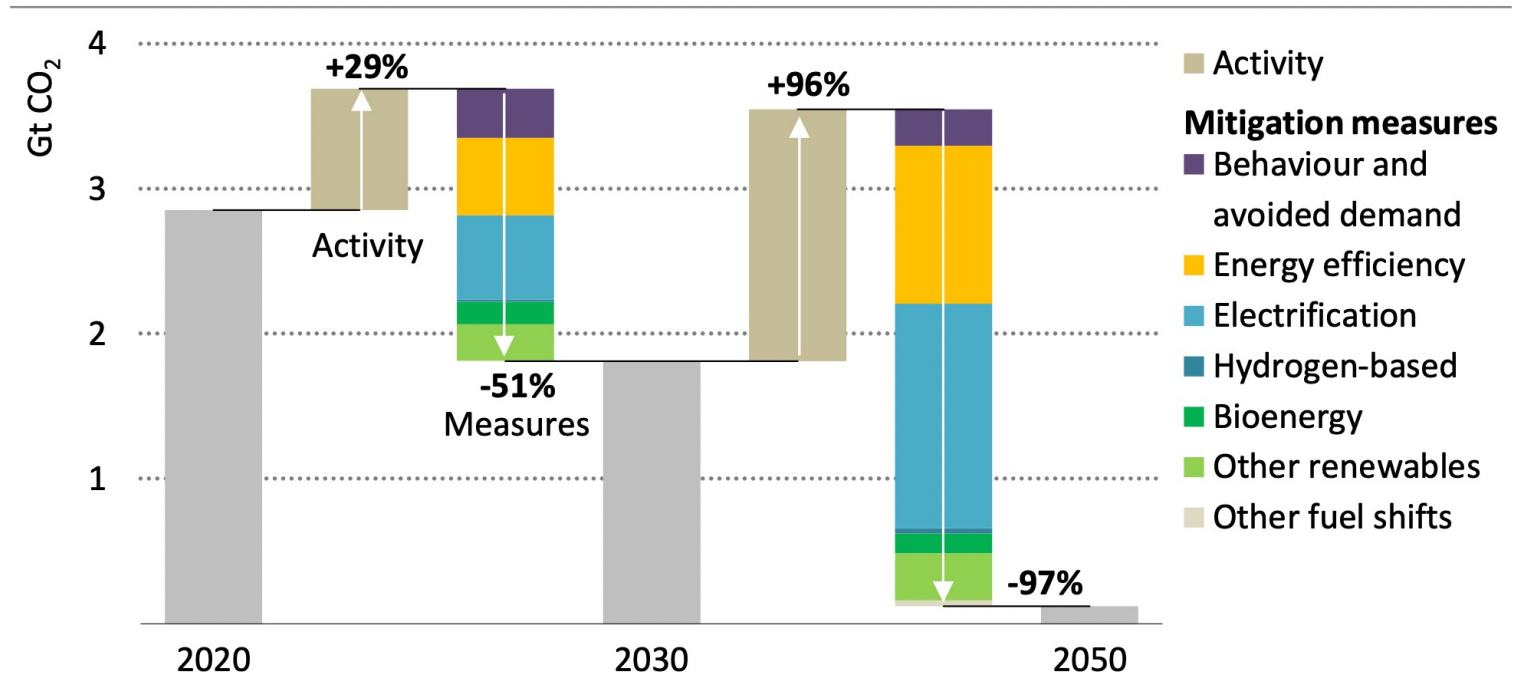


What is the greatest technical challenge your company faces in adopting new digital technologies?

(Select the most difficult.)



Net Sıfır Emisyon IEA



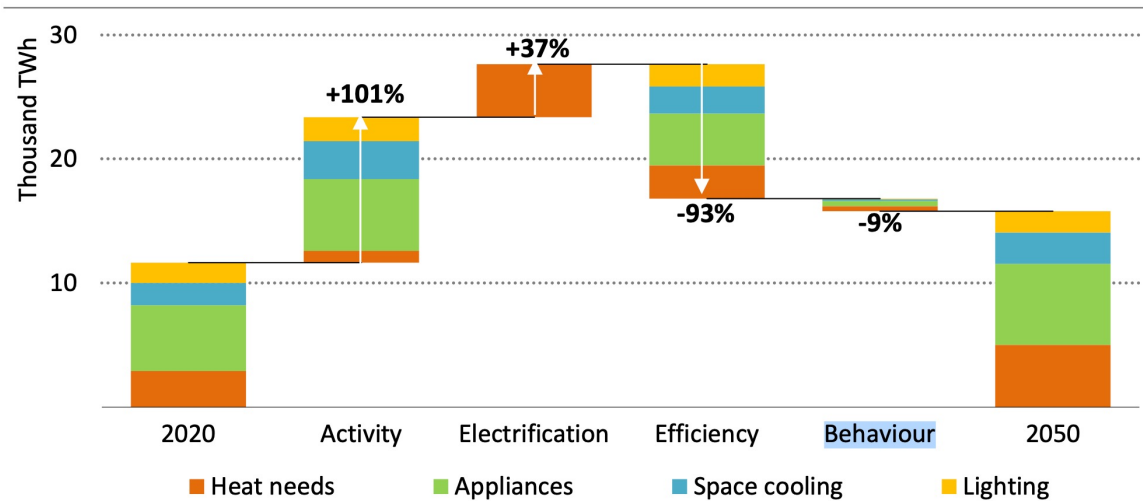
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Electrification and energy efficiency account for nearly 70% of buildings-related emissions reductions through to 2050, followed by solar thermal, bioenergy and behaviour

Notes: Activity = change in energy service demand related to rising population, increased floor area and income per capita. Behaviour = change in energy service demand from user decisions, e.g. changing heating temperatures. Avoided demand = change in energy service demand from technology developments, e.g. digitalisation.

Digitalleşme: 3 – Davranış : 88

Figure 3.30 ▷ Global change in electricity demand by end-use in the buildings sector



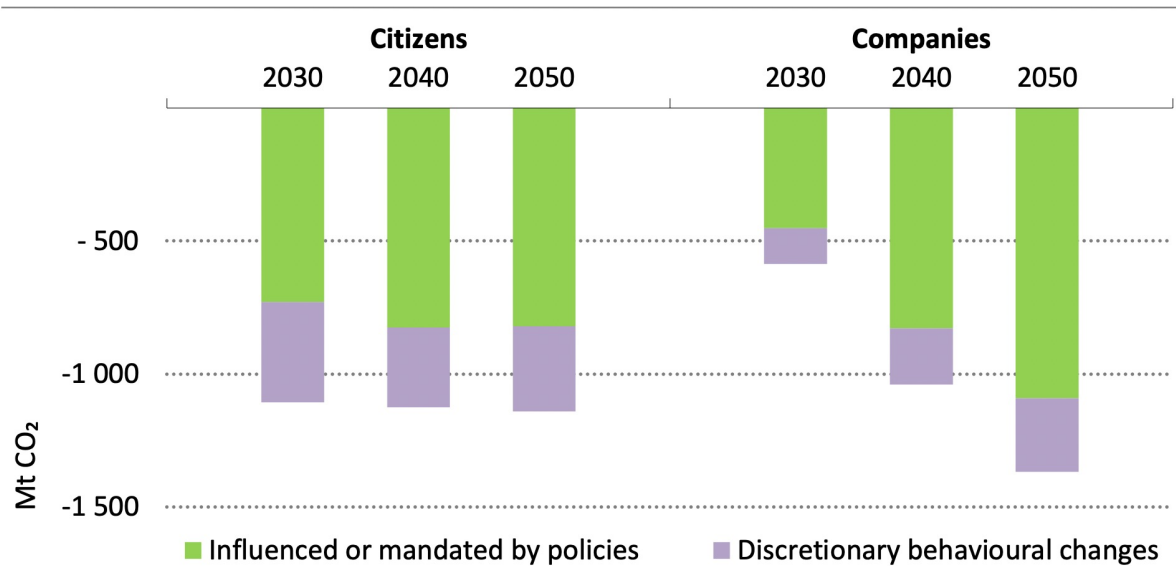
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Energy efficiency is critical to mitigate electricity demand growth for appliances and air conditioning, with savings more than offsetting the impact of electrifying heat

Category	2020	2030	2050
Buildings			
Share of existing buildings retrofitted to the zero-carbon-ready level	<1%	20%	>85%
Share of zero-carbon-ready new buildings construction	5%	100%	100%
Heating and cooling			
Stock of heat pumps (million units)	180	600	1 800
Million dwellings using solar thermal	250	400	1 200
Avoided residential energy demand from behaviour	n.a.	12%	14%
Appliances and lighting			
Appliances: unit energy consumption (index 2020=100)	100	75	60
Lighting: share of LED in sales	50%	100%	100%
Energy access			
Population with access to electricity (billion people)	7.0	8.5	9.7
Population with access to clean cooking (billion people)	5.1	8.5	9.7
Energy infrastructure in buildings			
Distributed solar PV generation (TWh)	320	2 200	7 500
EV private chargers (million units)	270	1 400	3 500

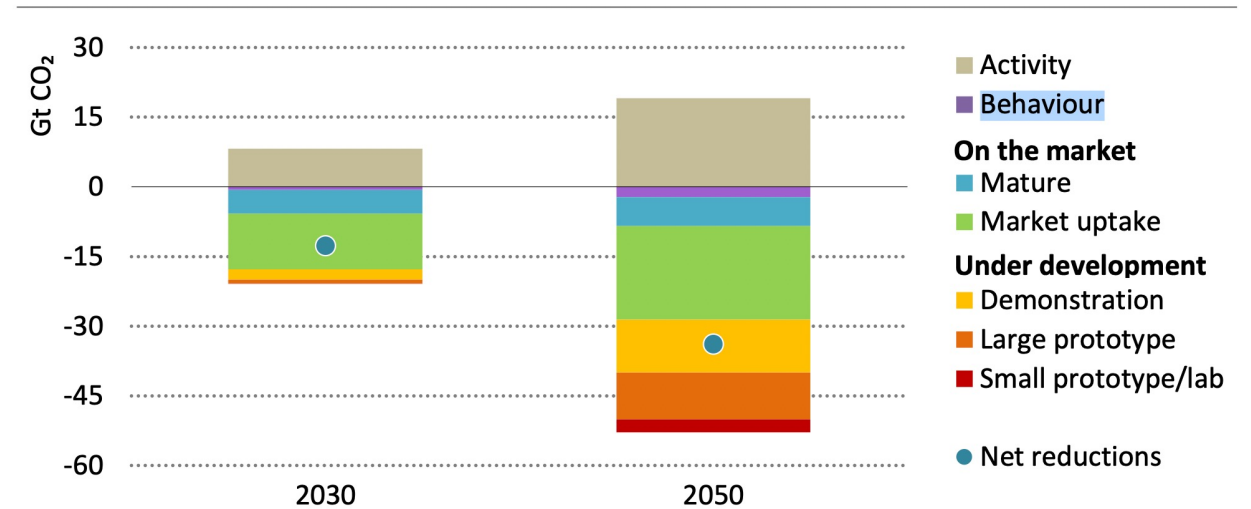
Dijitalleşme bir davranış değiştirme yöntemi ?

Figure 4.16 ▶ Emissions reductions from policy-driven and discretionary behavioural changes by citizens and companies in the NZE



Three-quarters of the emissions saved by behavioural changes could be directly influenced or mandated by government policies

Figure 4.22 ▶ Global CO₂ emissions changes by technology maturity category in the NZE

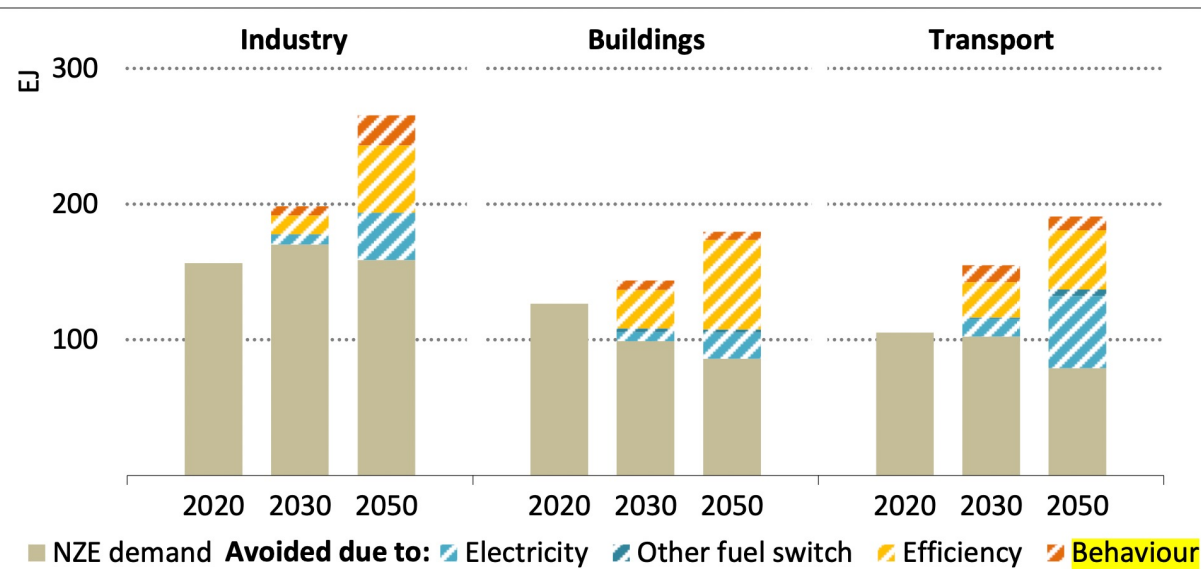


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While the emissions reductions in 2030 mostly rely on technologies on the market, those under development today account for almost half of the emissions reductions in 2050

Verimlilik

Figure 2.13 ▶ Total final consumption and demand avoided by mitigation measure in the NZE

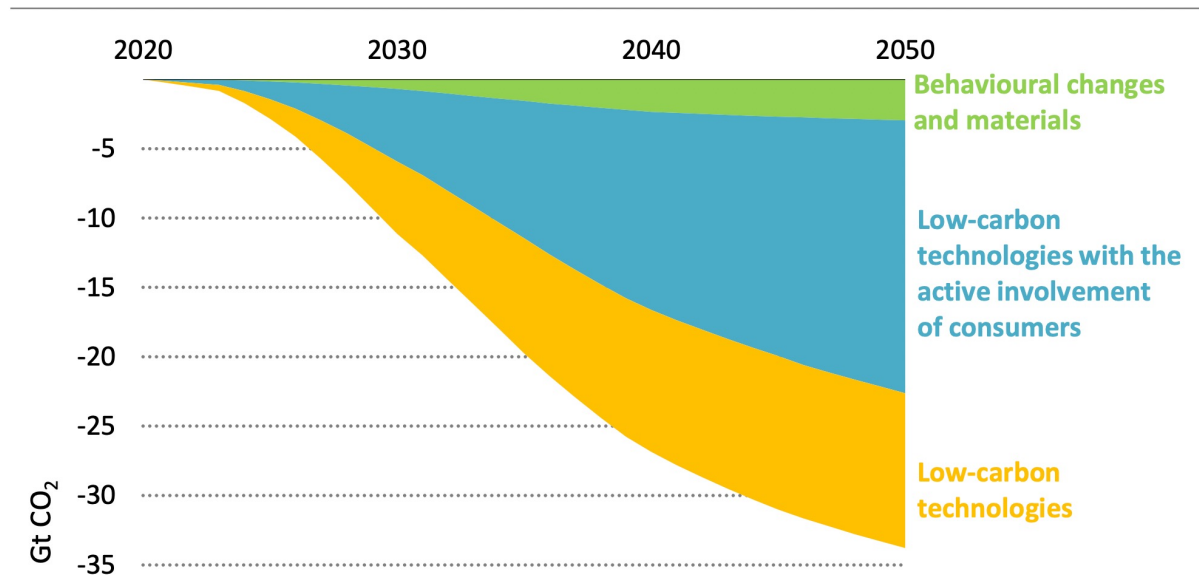


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Energy efficiency plays a key role in reducing energy consumption across end-use sector.

Notes: CCUS = carbon capture utilisation and storage. Other fuel switch includes switching to hydrogen-related fuels, bioenergy, solar thermal, geothermal, or district heat.

Figure 2.14 ▶ Role of technology and behavioural change in emissions reductions in the NZE



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Around 8% of emissions reductions stem from behavioural changes and materials efficiency

Önemli sorular

- 3 boyutlu TV'ler neden tutmadı? **Tüketici basit sever**
- Tüketici elektrikli arabaları tercih edecek mi? **Zaman alabilir**
- Dağıtık bir enerji sistemi geliyor mu? **Görünen kadarı ile hayır**
- Fosil kaynakların sonu mu? Sıfır ile net sıfır farkı? **«Unabated'e dikkat»**
- Tüketici değişmek istiyor mu? **Tabii ki hayır, covid örneği**
- Dijitalleşme daha fazla insani bilimleri öne mi çıkarıyor? **«Evet»**
- Elektrifikasyon nasıl hızlanır? **«Isı pompaları fakat kemikleri ısıtmaz»**
- Yeni kavramlar - MW eşdeğer **«1000 MW Güneş = 250 MW baz yük»**
- Dijitalleşme diyoruz ama hep Python tarafındayız, çip-sensör tarafı tamamen ihmal edilmiş görünüyor. **«Dijitalleşme sadece yazılım değildir»**
- Enerji dönüşümünün kendi akli ve hızı mı var? **«İnsanın değişime direnci»**

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